Every Student Counts

Professional Development Guide
K - 12

Year 2 – All Day

Iowa Department of Education

K – 12 Session –Facilitator's Plan
Year 2 - All Day

Content Goals:

NCTM Geometry Standards

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments Represent and analyze mathematical situations and structures using algebraic symbols

- Use visualization, spatial reasoning, and geometric modeling to solve problems about geometric relationships

NCTM Measurement Standard

- Understand measurable attributes of objects and the units, systems, and processes of measurement

Principle Focus: Equity

Process Focus: Communication
Reasoning and Proof
Problem Solving

Overall Teaching Goal: Teaching and learning mathematics through problem solving

Activity	• Description for Facilitator	Time (Min)	Teacher Masters (TM) & Materials
1. Welcome and opening	• Welcome • Overview of ESC • Foundation for Action • Research Update • ESC Year 2		**TM 1:** Year 2 All Day Overview **TM 2:** Agenda **TM 3:** Expectations **TM 4:** PBIT Components **TM 5:** Meaningful Distributed Practice (MDP) Components **TM 6:** MDP Explanation **TM 7:** Research Citations **TM 8:** Lesson Plan format * **PPT**: PowerPoint Overview of ESC * **PPT** Notes: ESC Initiative – Research Base 1. Principles and Standards for School Mathematics (PSSM) 2. PSSM Quick Reference Guide

Activity	• Description for Facilitator	Time (Min)	Teacher Masters (TM) & Materials
2. Geometry and Measurement	1. Show PowerPoint Images of Geometry in our Lives 2. Why geometry? 3. What is geometry? 4. Role of Technology 5. How do children learn geometry?		* **PPT:** Images of Geometry in our Lives (optional music accompaniment) * **PPT:** ESC Geometry Overview ** **Video:** Cubic Tragedy
3. Team Meeting	1. Describe purpose and procedures for team meetings 2. Conduct a team meeting 3. Hand out data gathering sheet 4. Model the reading part of team meetings - read and discuss Assessment article from NCTM News Bulletin Sanchez		**TM 9:** ESC Implementation Log *** Related Resources: Sanchez & Ice. Assessment Issues: Strike a Balance in Assessment. NCTM News Bulletin, May/June 2005
4. Problem-Based Instructional Task: Perimeter and Area	1. Tile Activity 2. Debrief (model questioning and then debrief questioning) 3. Share assessment results from observation		**TM 10:** PBIT - Perimeter and Area **TM 11:** Perimeter/Area Handout **TM 12**: Geometric Reasoning Summary **1.** Overhead color tiles **2.** Color Tiles **3.** Markers **4.** Chart Paper **5.** Graphing Calculator – overhead **6.** Reading from CD with *Navigating through Geometry in grades 6-8. NCTM.* Malloy, Carol L. "Perimeter and Area Through the Van Hiele Model." *Teaching Mathematics in the Middle School*. Vol. 5, No. 2. (October 1999): 87-90

Activity	• Description for Facilitator	Time (Min)	Teacher Masters (TM) & Materials
5. Assessment	1. Assessment Principle from NCTM -- read and discuss, using Reflection Form handout 2. Discuss Classroom Assessment using powerpoint		**TM 13:** Assessment Principle Reflection * **PPT** Notes: ESC Classroom Assessment
6. Closure	1. Review goals for the day 2. Discuss Homework 3. Complete Evaluation		**TM 14:** Reading Assignments (Elementary, Middle, High School) **TM 15:** ESC Participant Feedback form * **PPT** Notes: All Day Agenda and Closure

*** PPT** Power Points (PPT) are available on ESC website (Project Resources; Slide Shows and Related Materials)
**** Video** is available on ESC website (Project Resources; Video)
*** Related Resources (Sanchez & Ice. Assessment Issues: Strike a Balance in Assessment. NCTM News Bulletin, May/June 2005)

- www.state.ia.us/educate/ecese/is/esc/index.hdml
  - user: ESCounts
  - Password: PBITSMDP

Facilitator's Tool for Planning the Session

What is the background reading?

What equipment and materials should **participants** bring?

What Teaching Masters need to be copied?

Handouts:

TM 1: Year 2 All Day Overview
TM 2: Agenda
TM 3: Expectations
TM 4: PBIT Components
TM 5: Meaningful Distributed Practice (MDP) Components
TM 6: MDP Explanation
TM 7: Research Citations
TM 8: Lesson Plan format
TM 9: ESC Implementation Log
TM 10: PBIT - Perimeter and Area

TM 11: Perimeter/Area Handout
TM 12: Reflections on Practice: Perimeter and Area Through the van Hiele Model
TM 13: Geometric Reasoning Summary
TM 14: Assessment Principle Reflection
TM 15: Reading Assignments (Elementary, Middle, High School)
TM 16: ESC Participant Feedback form

What Teaching Masters need to be copied for presenters?

TM 1: Year 2 All Day Overview
TM 2: Agenda
TM 3: Expectations
TM 4: PBIT Components
TM 5: Meaningful Distributed Practice (MDP) Components
TM 6: MDP Explanation
TM 7: Research Citations
TM 8: Lesson Plan format
TM 9: ESC Implementation Log
TM 10: PBIT - Perimeter and Area
TM 11: Perimeter/Area Handout
TM 12: Reflections on Practice: Perimeter and Area Through the van Hiele Model
TM 13: Geometric Reasoning Summary
TM 14: Assessment Principle Reflection
TM 15: Reading Assignments (Elementary, Middle, High School)
TM 16: ESC Participant Feedback form

Teaching supplies/materials/technologies

Chart Paper
Color Tiles
Graphing Calculator – overhead
Markers
Overhead color tiles
Principles and Standards for School Mathematics (PSSM)
PSSM Quick Reference Guide

Reading from CD with *Navigating through Geometry in grades 6-8. NCTM.* Malloy, Carol L. "Perimeter and Area Through the Van Hiele Model." *Teaching Mathematics in the Middle School*. Vol. 5, No. 2. (October 1999): 87-90

Activity 1: Opening and Overview of Every Student Counts (ESC)

Time: 60 minutes

Overview and Rationale: This is the opportunity for all K-12 participants to review the components of Every Student Counts (ESC). At this point the stage is set for the day and the year.

Conducting the Activity:

1. Welcome
2. Overview of ESC
    - Purpose, Goals, Timeline
    - Expectations
        - attend and actively participate in ESC state meetings
        - attend and actively participate in local team meetings
        - do homework
        - be an active participant with your team
        - support your colleagues in their learning
        - help create and be part of a learning community
        - Fulfill the expectations and Drake credit available
        - orient and help support new members to ESC
3. Foundation for Action
    - Content Standards
    - Process Standards
    - ESC Components
        - Problem-Based Instructional Task (PBIT)
            - What do you know about PBIT? Participants discuss in small groups, then whole group share, elaborate, clarify.
        - Meaningful Distributed Practice (MDP)
            - Put teacher hat on the table to show that
            - Set a timer to show the activity can take place in 5 minutes and still address conceptual development
            - Do MDS activity 2
            - Address questions A through D in activity
            - Use observation sheet to record information for one or two tables. “0” means student does not have concept. ”X” means student does have concept. This information will be used later in the day.
            - Have a brief discussion of why these problems are examples of Meaningful Distributed Practice.
            - Review MDP by using the component teaching master
            - Review the highlights of the detailed definition of MDP TM 6, the – italics have been added to emphasize the key components. Remind participants that MDP should not last longer than 5 minutes. If manipulatives are used, it should be the teacher who uses them on the overhead. The purpose is to develop concepts, skills and problem-solving. It is NOT meant as an opportunity to drill skills. That type of practice could take place at another time, but it is not MDP.

Activity 1: Opening and Overview of Every Student Counts (ESC)

4. Research Update – year 2
5. ESC Year 2
    - New content focus this year: Geometry and Measurement
    - NCTM Principles are now integrated into the program, along with NCTM Process and Content Standards
    - New dimension -- Using Assessment to Inform Instruction (just announce and explain that this is a new thread that will be woven in throughout the project, more detail in the afternoon)
    - New (slightly revised) lesson plan format, notably including a new Checking For Understanding section

Materials

TM 1: Year 2 All Day Overview
TM 2: Agenda
TM 3: Expectations
TM 4: PBIT Components
TM 5: Meaningful Distributed Practice (MDP) Components
TM 6: MDP Explanation
TM 7: Research Citations
TM 8: Lesson Plan format
*** PPT**: PowerPoint Overview of ESC
*** PPT** Notes: ESC Initiative – Research Base
    1. Principles and Standards for School Mathematics (PSSM)
    2. PSSM Quick Reference Guide
    3. Clipboard
    4. Teacher hat or some indication to use to show teacher time
    5. Timer

TM 1

Every Student Counts means . . .

Teach for Understanding and Focus on Meaning

Problem-Based Instructional Tasks Teaching through Problem Solving	Meaningful Distributed Practice of Concepts, Skills, & Problem Solving

Today's Goals . . .

Content Goal:	Geometry Measurement
Principle Goal:	Assessment
Process Goal:	Communication, Reasoning and Proof, Problem Solving

Today's Activities . . .

- *Analyze characteristics and properties of two-dimensional geometric shapes and develop mathematical arguments*
- *Represent and analyze mathematical situations and structures using algebraic symbols*
- *Use visualization, spatial reasoning, and geometric modeling to solve problems about geometric relationships*

TM 2

Every Student Counts
K – 12 Agenda
September 13 – 14, 2005

- Overview of Every Student Counts
- Geometry and Measurement
- Team Meeting
- Geometry Problem-Based Instructional Task
- Embedding Formative Assessment
- Summary and Closure Activity
- Assignments/Evaluation

TM 2 Continued

Year Two
K – 12 All Day Agenda

Content Goals:

NCTM Geometry Standards

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments Represent and analyze mathematical situations and structures using algebraic symbols
- Use visualization, spatial reasoning, and geometric modeling to solve problems) about geometric relationships

NCTM Measurement Standard

- Understand measurable attributes of objects and the units, systems, and processes of measurement

Principle Focus: Equity

Process Focus: Communication
Reasoning and Proof
Problem Solving

Agenda:

- Overview of Every Student Counts
- Geometry and Measurement
- Team Meeting
- Geometry Problem-Based Instructional Task
- Embedding Formative Assessment
- Summary and Closure Activity

TM 3

EVERY STUDENT COUNTS
EXPECTATIONS FOR YEAR TWO

- Attend and actively participate in ESC state meetings
- Attend and actively participate in local team meetings
- Do homework
- Be an active participant with local team
- Support your colleagues in their learning
- Help create and be part of a learning community
- Orient and help support any new members to ESC

  e.g. provide materials obtained from last year

TM 4

PROBLEM-BASED INSTRUCTIONAL TASKS

- Help students develop a deep understanding of important mathematics
- Are accessible yet challenging to all students
- Encourage student engagement and communication
- Can be solved in several ways
- Encourage the use of connected multiple representations
- Encourage appropriate use of intellectual, physical and technological tools

TM 5

Meaningful Distributed Practice of Concepts, Skills, and Problem-Solving

- Help students develop a deep understanding of a BIG IDEA
- Use problems and activities that help students learn to use multiple representations, and learn to use multiple reasoning strategies
- Help students develop a deep understanding so that they can use the representations and reasoning flexibly and fluently
- Use problems from a variety of contexts so students learn when it makes sense to apply this BIG IDEA in everyday life.

TM 6

Explanation of Meaningful Distributed Practice of Concepts, Skills and Problem Solving

What is the Research Rationale?

Long-term retention is best served if assignments are spread out in time rather than concentrated within short intervals (Iowa Content Network, http://www.state.ia.us/educate/ecese/tqt/tc/prodev/mathematics.html).

What Does Meaningful Distributed Practice for Concepts and Problem Solving Look Like?

Distributed practice is *consistent* practice distributed over a *long period of time*. It can be presented in *brief* (about five minutes) problem solving and/or conceptual activities *three to five times a week* throughout the school year. These instructional activities should reinforce the *BIG IDEA* that you have chosen for your building improvement plan for Every Student Counts. The problems and activities that you use for distributed practice should be chosen to *help students develop a deep understanding of that BIG IDEA*.

These problems and activities should be *student-centered*, in the sense that the students derive their own ways to model, to reason with, and to explain the problems.
The problems and activities should:

- Include a *variety of connections to real-world situations*
- Encourage the use of a *variety of models or representations*
- Allow for a *variety of reasoning or solution strategies*.

Ask for *two, or possibly three, explanations* of the problem.
Summarize by briefly highlighting the *different representations and reasoning strategies* that were used.

What are the *Purposes* of Meaningful Distributed Practice?

To help students develop a deep understanding of a ***BIG IDEA***,

- Problems and activities should help students
  - learn to use *multiple representations*, and
  - learn to use *multiple reasoning strategies*
- With such deep understandings that they can use the representations and reasoning
  - *Flexibly*
  - *Fluently*.

In addition, by using problems from a variety of contexts, the students should learn when it makes sense to *apply* this BIG IDEA in *everyday life*.

TM 7

Iowa's *Every Student Counts* Initiative

Research Base Presentation
September 2005

References

Grouws, Douglas A., & Cebulla, Kristin J. (2000). Focus on meaning. In *Improving Student Achievement in Mathematics* (pp. 13-14). Geneva, Switzerland: International Academy of Education.

Hiebert, James (2003). What research says about the NCTM Standards. In J. Kilpatrick, W. G. Martin, and D. Schifter (Eds.), *A Research Companion to Principles and Standards for School Mathematics* (pp. 5-23). Reston, VA: National Council of Teachers of Mathematics.

Hiebert, James, & Wearne, Diana (1993). Interactional tasks, classroom discourse, and students' learning in second-grade arithmetic. *American Educational Research Journal, 30*, 393-425.

Kilpatrick, J., Martin, W. G., & Schifter, D. (Eds.), *A Research Companion to Principles and Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.); Mathematics Learning Study Committee, National Research Council (2001). Conclusions and recommendations. In *Adding It Up: Helping Children Learn Mathematics* (pp. 407-432). Washington, D.C.: The National Academies Press.

Madsen, Anne L., & Lanier, Perry (1995). Does conceptually oriented instruction enhance computational competence? *Focus on Learning Problems in Mathematics, Fall Edition, Volume 17, Number 4*, 42-64.

Rea, Cornelius P., & Modigliani, Vito (1985). The effect of expanded versus massed practice on the retention of multiplication facts and spelling lists. *Human Learning, Volume 4*, 11-18.

Schoenfeld, Alan H. (2002). Making mathematics work for all children: Issues of standards, testing, and equity." *Educational Researcher, 31*, 13-25.

Stein, Mary Kay, Boaler, Jo, & Silver, Edward A. (2003). Teaching mathematics through problem solving: Research perspectives. In H. L. Schoen (Ed.), *Teaching Mathematics Through Problem Solving, Grades 6-12* (pp. 245-256). Reston, VA: National Council of Teachers of Mathematics.

Stigler, J. W., & Hiebert, J. (1997). Understanding and improving classroom mathematics instruction: An overview of the TIMSS video study. *Phi Delta Kappan, 79*(1), 14-21.

Usiskin, Z., & Dossey, J. (2004). *Mathematics education in the United States 2004: A capsule summary fact book*. Reston, VA: National Council of Teachers of Mathematics.

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Willingham, Daniel (2002). Allocating student study time: "Massed" versus "distributed" practice. *American Educator, Summer 2002*.

Published Research Reviews

- National Center for Improving Student Learning and Achievement in Mathematics and Science (2004)
  Powerful Practices: Research-Based Practices for Teaching and Learning Mathematics and Science
  http://www.learningpt.org/msc/products/practices.htm
- National Council of Teachers of Mathematics (2003)
  Research Companion to Principles and Standards
  http://my.nctm.org/store/ECat/product.asp?ID=12341
- National Council of Teachers of Mathematics (2003)
  Teaching Mathematics Through Problem Solving, Research Chapter
  http://my.nctm.org/store/ECat/product.asp?ID=12577
- *Standards-Based School Mathematics Curricula: What Are They? What Do Students Learn?* (2003)
  https://www.erlbaum.com/shop/tek9.asp?pg=products&specific=0-8058-4337-X
- National Research Council (2001)
  Adding It Up
  http://www.nap.edu/books/0309069955/html/
- International Bureau of Education (2000)
  Improving Student Achievement in Mathematics
  http://www.ibe.unesco.org/International/Publications/EducationalPractices/prachome.htm

National Textbook Evaluations and Reviews

- National Research Council, 2004
  On Evaluating Curricular Effectiveness: Judging the Quality of K-12 Mathematics Evaluations
  http://books.nap.edu/catalog/11025.html
- American Association for the Advancement of Science, Review of Algebra Texts, 2000
  http://www.project2061.org/publications/articles/textbook/hsalg/default.htm?jsRedirect&txtRef=
- U.S. Department of Education, Exemplary Programs, 1999
  http://www.enc.org/professional/federalresources/exemplary/promising/document.shtm?input=CDS-000496-496_toc,00.shtm

Research Review Panels

- Federal What Works Clearinghouse http://w-w-c.org/
- Iowa Content Network
  http://www.state.ia.us/educate/ecese/tqt/tc/prodev/mathematics.html

National and International Tests

- NAEP (http://nces.ed.gov/nationsreportcard/mathematics/)
- SAT and ACT (http://www.collegeboard.com/splash and http://www.act.org/)
- TIMSS (http://nces.ed.gov/timss/)
- PISA (http://nces.ed.gov/Surveys/PISA/)

TM 8

PROBLEM-BASED INSTRUCTIONAL TASK LESSON PLAN

OBJECTIVE/BENCHMARK:

TITLE:

GRADE LEVEL/COURSE: Middle School

PRE-REQUISITE KNOWLEDGE:

NCTM STANDARD(S): (Shaded)

NCTM Content Standards →	Number & Operations	Algebra	Geometry	Measurement	Data Analysis & Probability
NCTM Process Standards →	Problem Solving	Reasoning & Proof	Communication	Connections	Representation

MATERIALS NEEDED:

Audio-visual:
Manipulatives/Materials:
Literature:
Technology/Software:
Other:

MAIN LESSON DEVELOPMENT:

- **Launch**
- **Explore**
- **Summarize**

MODIFICATIONS/EXTENSIONS:

- **Modifications**
- **Extensions**

CHECKING FOR UNDERSTANDING (FORMATIVE ASSESSMENT)

- **What will you assess?**
- **How will you assess it?**

---------- (REFLECTION AFTER TEACHING THE LESSON) ----------

- **How did the students perform?**
- **How will you use this information to guide future instructional decisions?**

Activity 2: Geometry and Measurement
Time: 180 minutes

Overview and Rationale: This section of the day will provide the rationale, background and information regarding the year two content focus – geometry and measurement.

Conducting the Activity:

1. Show PowerPoint Images of Geometry in our Lives
2. Why geometry?
   - Start with MS job interview/applications - manhole covers, cake, fire hydrant nuts
   - Show Slide Show: applications, nature, technology, art, pentagonal fire hydrant bolts, round manhole covers, etc.
   - Show part of *Donald in Mathemagicland*
3. What is geometry?
   - Ask participants: Geometry is the study of _____?
   - The big ideas of geometry are _____?
   - Share, elaborate, clarify.
   - Go through story of "shape".
   - Study NCTM geometry standard
   - Discuss synthetic, coordinate, vector, etc.
4. Role of Technology
   - In applications of geometry -- computer animation, GPS (e.g., geocaching), GIS, CAD, visualization software, …
   - In teaching geometry -- dynamic geometry software (like GSP and Cabri), applets
5. How do children learn geometry?
   - Focus on van Hiele model -- intro, simple examples, more in afternoon area/perimeter activity
   - Also include general info about how children learn from new NAS book? -- prior knowledge, deep understanding, metacognition

Materials

* **PPT:** Images of Geometry in our Lives (optional music accompaniment)
* **PPT:** ESC Geometry Overview
** **Video:** Cubic Tragedy

Activity 3: Team Meeting
Time: 35 minutes

Overview and Rationale: This section of the day will provide the outline for team meetings for the year and will give teams a time to have their first meeting..

Conducting the Activity:

1. Describe purpose and procedures for team meetings
2. Conduct a team meeting
   - Present and use team meeting log - handout
   - Decide when and where you will have next meeting, who will organize, get snacks, etc.
3. First homework - hand out data gathering sheet
4. Model the reading part of team meetings - read and discuss Assessment article from NCTM News Bulletin

Materials

TM 9: ESC Implementation Log
*** Related Resources: Sanchez & Ice. Assessment Issues: Strike a Balance in Assessment. NCTM News Bulletin, May/June 2005

TM 9

Every Student Counts
AEA/Urban 8 Math Team Log

Name of Team: **Team Members Attending:**	**Date of Meeting:** **Time Started:** **Time Ended:**

1. Process homework assignments

2. Update regarding collaboration with classroom teaching partners
   Each member should share observation/lesson plan for their teaching practice with the group.
   Group members should offer additional support, suggestions, etc. to the person sharing.

Participant	Lesson topic	Grade Level	Date taught

3. Other agenda items specific to your AEA/Urban 8 Math Team.

4. Next meeting – Decide on the following:

   - Date: _____
   - Place: _____
   - Facilitator: _____
   - Recorder: _____
   - Question for Consideration:

Activity 4: Problem-Based Instructional Task: Perimeter and Area
Time: 90 minutes

Overview and Rationale: This section of the day will provide the outline for team meetings for the year and will give teams a time to have their first meeting..

Conducting the Activity:

1. Tile Activity
2. Debrief (model questioning and then debrief questioning)
3. Share assessment results from observation

Materials

TM 10: PBIT - Perimeter and Area
TM 11: Perimeter/Area Handout
TM 12: Geometric Reasoning Summary

1. Overhead color tiles
2. Color Tiles
3. Markers
4. Chart Paper
5. Graphing Calculator – overhead

Reading from CD with *Navigating through Geometry in grades 6-8. NCTM.* Malloy, Carol L. "Perimeter and Area Through the Van Hiele Model." *Teaching Mathematics in the Middle School*. Vol. 5, No. 2.

TM 10

PROBLEM-BASED INSTRUCTIONAL TASK
LESSON PLAN

OBJECTIVE/BENCHMARK:
- Analyze characteristics and properties of two-dimensional geometric shapes
- Understand relationships among side lengths, perimeters, and areas

TITLE: Perimeter and Area through the Van Hiele Model

GRADE LEVEL/COURSE: Middle School

PRE-REQUISITE KNOWLEDGE:
Knowledge of how to find perimeter
Knowledge of how to find area

NCTM STANDARD(S): (Shaded)

NCTM Content Standards →	Number & Operations	Algebra	Geometry	Measurement	Data Analysis & Probability
NCTM Process Standards →	Problem Solving	Reasoning & Proof	Communication	Connections	Representation

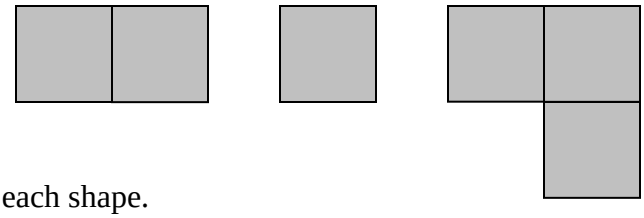
MATERIALS NEEDED:

Audio-visual: Overhead color tiles

Manipulatives/Materials:
- Color Tiles
- Markers
- Chart Paper
- Malloy, Carol L. "Perimeter and Area Through the Van Hiele Model." *Teaching Mathematics in the Middle School*. Vol. 5, No. 2. (October 1999): 87-90
- Teaching Master (TM) Perimeter and Area

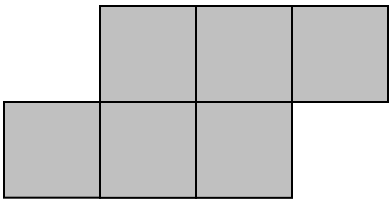
Literature:
Technology/Software:

Other:



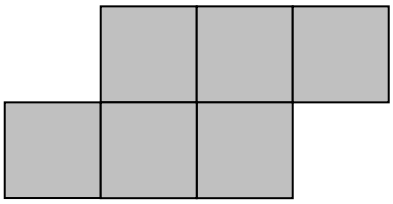
MAIN LESSON DEVELOPMENT:

Launch: Build shapes with tiles.
Find the perimeter and the area of each shape.
Have the participants use a set of color tiles (all one color) to make the final shape. Explain that we're going to use this shape to build a shape with perimeter of 16.



Explore

1. Have the participants form groups of two or three to work on the following questions. Assume that the edges of the small squares are one unit in length. Add tiles so that you have a perimeter of 16. Squares that are added must meet so that they are touching on at least one side of the figure. Draw your shape.



2. Is there more than one way to build a shape that has a perimeter of 16? If so, draw the shapes. If not, explain why.

3. What is the fewest number of tiles that can be added to increase the perimeter to 16 units? Describe this shape. What is its area?

4. What is the greatest number of tiles that can be added to increase the perimeter to 16 units? Describe this shape. What is its area?

5. What do you notice as you were building these shapes and figuring area and perimeter?

Summarize:

Have different groups model their answers on the overhead for questions 1 through 4. Emphasize questions which guide students' thinking to higher levels of Van Hiele Model. Discuss question 5 as whole group. Collect individual responses to number 5.

MODIFICATIONS/EXTENSIONS:

Extensions:

- This could be extended to volume and surface area
- Find all the sets of noncongruent rectangles having fixed perimeters of the integers from 12 to 23?
  - Could a perimeter be an odd number? Why or why not?
  - Could an area be an odd number? Why or why not?

Modifications:
Questions to ask if participants are struggling

- What is the area of the original figure?
- What is the perimeter of the original figure?
- Where would you place a tile to increase the perimeter by 1? By 2? By 3?

CHECKING FOR UNDERSTANDING (FORMATIVE ASSESSMENT)

- **What will you assess?**
  - Knowledge of the relationships among side lengths, perimeters and areas
  - Levels of Van Hiele reasoning students are exhibiting

- **How will you assess it?**
  - During student discussion time, teacher observation will determine whether students can correctly distinguish between perimeter and area and can use the concepts appropriately to solve problems.
  - Collection of individual responses to number 5 on the Perimeter and Area Worksheet will be explored for patterns in learning.

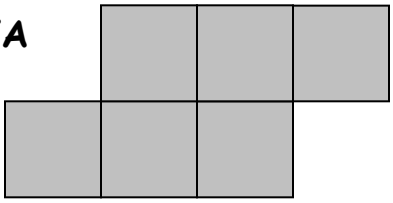
---------- (REFLECTION AFTER TEACHING THE LESSON) ----------

- **How did the students perform?**

- **How will you use this information to guide future instructional decisions?**

TM 11

TM: PERIMETER AND AREA



EXPLORE

1. Assume that the edges of the small squares are one unit in length. Add tiles so that you have a perimeter of 16. Squares that are added must meet so that they are touching on at least one side of the figure. Draw your shape.

2. Is there more than one way to build a shape that has a perimeter of 16? If so, draw the shapes. If not, explain why.

3. What is the fewest number of tiles that can be added to increase the perimeter to 16 units? Describe this shape. What is its area?

4. What is the greatest number of tiles that can be added to increase the perimeter to 16 units? Describe this shape. What is its area?

5. What do you notice as you were building these shapes and figuring area and perimeter?

EXTENSION

6. Find all the sets of noncongruent rectangles having fixed integral perimeters of the integers from 12 to 24?

TM 12

GEOMETRIC REASONING SUMMARY

Problem-based Task/ Assessment
Perimeter and Area

Analyzes characteristics of 2-D shapes

Understands relationships among side lengths, perimeters and areas

Student Names	**Concrete** Level 0 Knows perimeter is length of sides; experiments with or without moving tiles randomly.	**Analysis** Level 1 Uses materials to find a rule for adding and moving tiles by watching what happens to perimeter and area as tiles are moved.	**Informal Deduction** Level 2 Uses previous knowledge to develop informal arguments to show generalizations are true; Determines the best shape to satisfy the conditions	**Deduction** Level 3 Uses theorems deductively and understands the structure of geometric systems related to perimeter and areas of figures	**Rigor** Level 4 Creates own theorems and postulates
Name 1					
Name 2					
Name 3					
Name 4					
Name 5					
Name 6					
Name 7					

Activity 5: Assessment
Time: 40 minutes

Overview and Rationale: This section of the day will provide the outline for team meetings for the year and will give teams a time to have their first meeting..

Conducting the Activity:

1. Discuss assessment principle
2. Review ESC Classroom Assessment PowerPoint

Materials

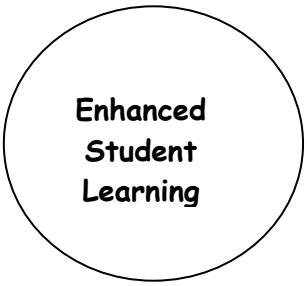
TM 13: Assessment Principle Reflection
***** **PPT** Notes: ESC Classroom Assessment

TM 13

ASSESSMENT PRINCIPLE REFLECTION

1. The *PSSM* section on the assessment principle states two powerful uses for assessment. Read each section and prepare a summary for each statement.

- **Assessment should enhance students' learning.** (Show a cause-effect relationship between teacher behaviors and student learning.)



- **Assessment is a valuable tool for making instructional decisions.**

    1. How can teachers be sure they reflect the mathematics that students should know and be able to do?

    2. How can teachers be sure they enhance mathematics learning?

    3. How can teachers be sure they promote equity?

    4. How can teachers be sure they use an open process?

    5. How can teachers be sure they promote valid inference?

    6. How can teachers be sure they use a coherent process?

Activity 6: Closure
Time: 15 minutes

Overview and Rationale: This section of the day will provide the outline for team meetings for the year and will give teams a time to have their first meeting..

Conducting the Activity:

1. Tile Activity
2. Debrief (model questioning and then debrief questioning)
3. Do geostick activity
4. Debrief differentiation discussion
   - model questioning and then debrief questioning)
5. Share assessment results from observation

Material

TM 14: Reading Assignments (Elementary, Middle, High School)
TM 15: ESC Participant Feedback form
*** PPT** Notes: All Day Agenda and Closure

TM 14

Elementary Day 1
Reading Assignment

The principle of focus for the K-12 All day was Assessment.

- Read the section in the PSSM.
- on Assessment for Grades K-12 in *Principles and Standards for School Mathematics*, pages 21-23.

- This reading describes six assessment standards and elaborates on two purposes for assessment: enhancing learning and making instructional decisions.

- Reflection Question: How important is assessment for learning? Defend your position.

2. Using assessment in new ways requires new skills. Read about how teachers have begun doing this.

- Read Chapter 7 "Listening to Children: Informing Us and Guiding Our Instruction" by Ema Yackel in *Teaching Mathematics through Problem Solving Grades PreK-6*, pages 107-121.

- As the title indicates, this reading addresses the importance of listening to understand students' thinking.

- Reflection Question: What do you think is meant by "we (teachers) hear what we understand not understand what we hear"? How can we become better listeners to our children?

- Read Chapter 15, "What Research Says About Teaching Mathematics Through Problem Solving" by Cai in *Teaching Mathematics through Problem Solving Grades PreK-6* pages 241-253.

- This chapter is a readable and complete summary of the research base for this approach.

- Reflection Question: Prepare an answer to each of the four issue questions that would convince your peers of the value of this approach.

3. Geometry will be the content standard focus for Days 2-4.

- Read "Geometry Standard" for Grades Pre-K – 12 (pp. 40-42) and first subskill "Analyzing characteristics of two-and three-dimensional geometric shapes …" for Grades K-2 (p. 96-97) and Grades 3-5 (pp. 164-166) in *Principles and Standards for School Mathematics*.

- Be prepared to analyze the analyze the Day 3 activities in terms of the first sub-skill of the Geometry Standard.

- Reflection Question: According to these readings, what is the teacher's role in developing reasoning and proof in mathematics classes?

Every Student Counts – Year 2 – Middle School
Reading Assignment for Day 1

- Read "The Van Hiele Framework" – a reading by Carol Malloy on the CD which comes with NCTM Navigating through Geometry

- Read Geometry Standard – (pp. 232 – 239) in the NCTM Principles and Standards

  Reflection Question for First Two Readings: What are the things that distinguish the behavior of students doing geometry at different levels of the Van Hiele Framework?

- Read Equity Principle – (pp. 12-14) in the NCTM Principles and Standards

  Reflection Question: What are some things you have seen (or wish you had seen) in classrooms that exemplify this principle?

  Reflection Question: What impact will this principle have on you as a trainer and/or in a classroom?

Every Student Counts – Year 2 – High School
Reading Assignment for Day 1

Assessment

In *Every Student Counts* we focus on problem-based instructional tasks, meaningful distributed practice, and teaching for understanding. This year we are adding a new dimension – assessment. The following readings consider the role of assessment (and questioning) in a problem-based classroom.

1. Read Chapter 11, "The Sound of Problem Solving" by Driscoll in *Teaching Mathematics through Problem Solving Grades 6 – 12*, pages 161-175.
   - This reading provides guidelines for effective listening to students as they work alone and in groups on problems with the purpose of better understanding what and how the students are thinking as they learn important mathematical ideas.
   - Reflection Question: Compare and contrast the five main question types in the "taxonomy of questioning intentions" on pages 173-4. What are some other questions of each type?

2. Read Chapter 12, "Classroom Assessment Issues Related to Teaching Mathematics through Problem Solving" by Ziebarth in *Teaching Mathematics through Problem Solving Grades 6 – 12*, pages 177-189.
   - This chapter describes some of the characteristics of good assessment in problem-based classrooms and discusses some challenges that teachers may find in adopting such assessment.
   - Reflection Question: The author raises four practical issues for teachers related to assessment in a problem-based classroom (see pp. 180-81). Which of these (or others that you identify) do you think will require the most difficult adjustment for high school mathematics teachers in your area?

NCTM Principles

NCTM's *Principles and Standards for School Mathematics* presents six Principles that describe essential features of high quality mathematics education: Equity, Technology, Teaching, Learning, Curriculum, and Assessment. The Assessment Principle is a theme that will run throughout Year 2 of Every Student Counts. The Curriculum Principle will be a major focus in Year 3. The other four Principles will each be the focus of one of the days in Year 2. Equity is the Principle for Day 1.

3. Read the section on the Equity Principle in Chapter 2: Principles for School Mathematics from Principles and Standards for School Mathematics.
   - The Equity Principle states that: "Excellence in mathematics education requires equity–high expectations and strong support for all students."
   - Reflection Question: There are three main points made in the description of the Equity Principle. How is each of these key points about equity reflected, or not, in mathematics classrooms in your area?

NCTM Process Standards

NCTM's *Principles and Standards for School Mathematics* presents five content standards and five process standards. The Process Standards are: Representation, Connections, Communication, Reasoning and Proof, and Problem Solving. All the Process Standards are woven throughout *Every Student Counts*. The Problem Solving Standard is implicit in the theme of Problem-Based Instructional Tasks. Each of the other four Standards will be the focus of one of the days of Year 2. Day 1 focuses on Representation.

4. Read "Representation" for Grades Pre-K – 12 (pp. 67-71) and for Grades 9 –12 (pp. 360-364) in *Principles and Standards for School Mathematics*.
   - The Representation Standards consists of three main goals. Be prepared to analyze the Day 1 activities in terms of the three goals of the Representation Standard.
   - Reflection Question: According to these readings, what is the teacher's role in identifying and using multiple representations in mathematics classes?

TM 15

Every Student Counts

Participant Feedback **Date:**

What is your primary role?

_____AEA Team _____Urban 8 District Team

What were your key learnings from this session?

What questions do you have about the information and content presented and discussed during this session?

What considerations and concerns do you have about your individual use and follow-through of the information presented and discussed this session?

What considerations and concerns do you have about your team use and follow-through of information presented and discussed this session?